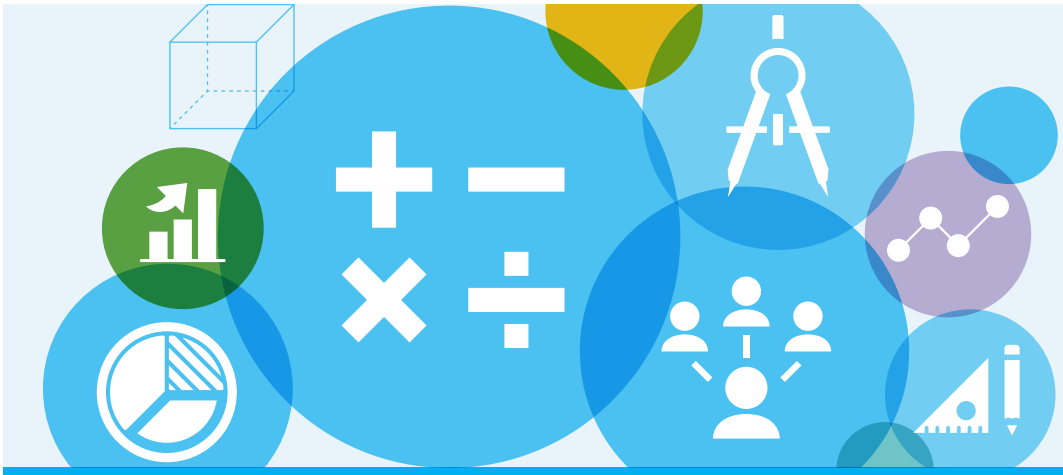


STUDENT VERSION

THE NEW NORMAL

Activity Items

There are no separate items for this activity.

Student Learning Objectives

- I will be able to determine if a distribution is normal based on histograms and on normal probability plots.
- I will be able to identify which data sets can and cannot be modeled accurately using a normal distribution.

Statistical measures such as median, mean, range, standard deviation (SD), and interquartile range (IQR) provide useful and interesting snapshots of data sets. In this activity, you will analyze county-level data from the U.S. Census Bureau.

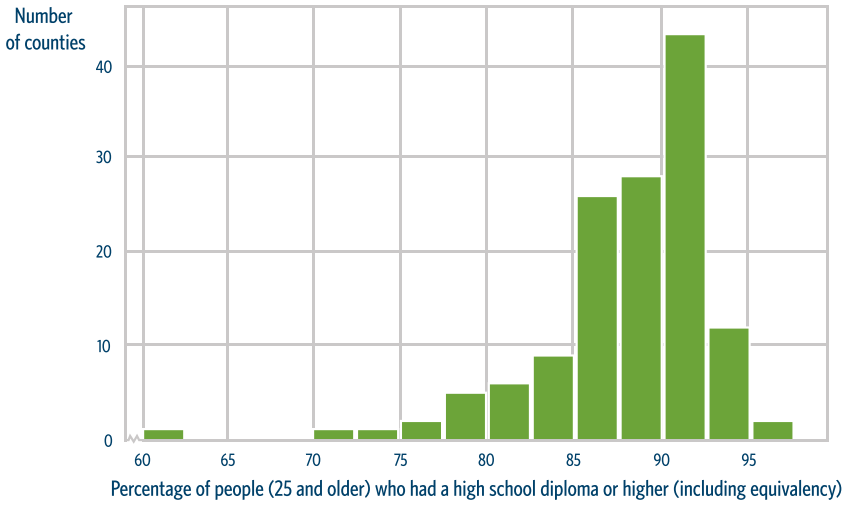
Complete either Version A or Version B of this activity according to your teacher's instructions.

NAME:_____ DATE:_____

Activity Version A

For questions 1–6, you will explore histograms and normal probability plots that use various data from 136 U.S. counties surveyed by the Census Bureau in 2014.

1. Examine the histogram below, which shows the percentage of people (25 and older) in these counties who had the equivalent of a high school diploma or higher, to answer the questions that follow.



Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this histogram, is the data distribution unimodal?

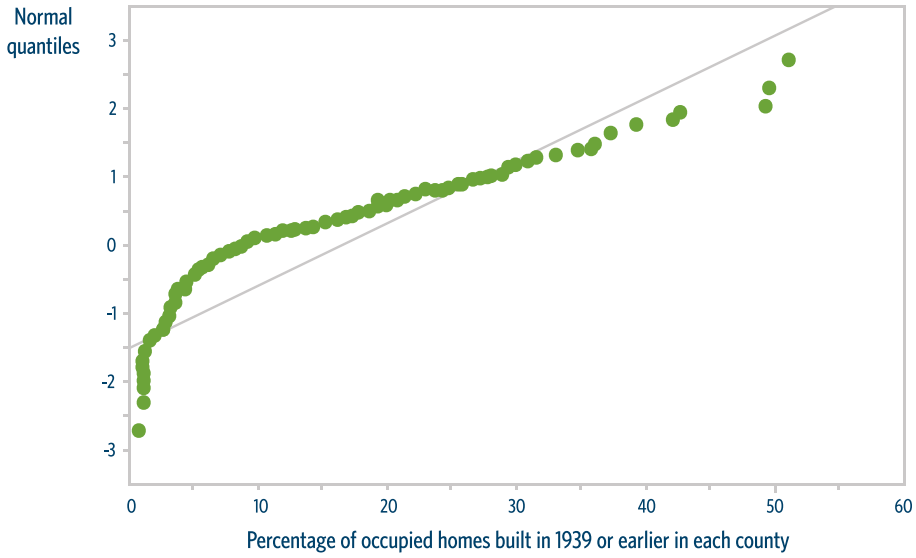
b. Is it approximately symmetrical?

c. Is it approximately bell-shaped?

d. Is it approximately normal?

e. If not normal, is the distribution skewed? If so, in which direction?

2. Examine the normal probability plot below, which shows the percentage of occupied homes built in 1939 or earlier in these counties, to answer the questions that follow.



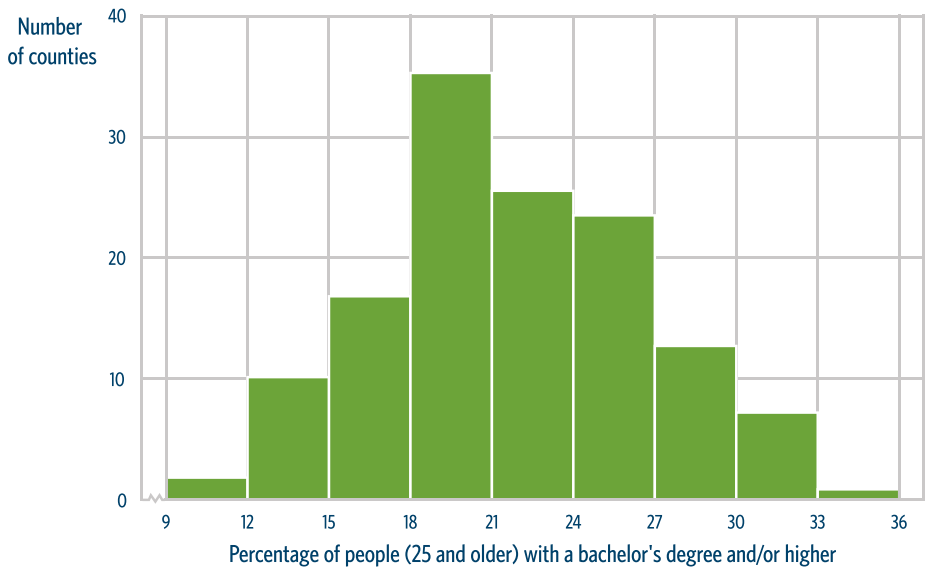
Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this normal probability plot, is the data distribution approximately normal? Explain how you know.

b. If not normal, is the distribution skewed? If so, in which direction? Explain how you know.

3. Examine the histogram below, which shows the percentage of people (25 and older) in these counties who had bachelor's degrees, to answer the questions that follow.



Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this histogram, is the data distribution unimodal?

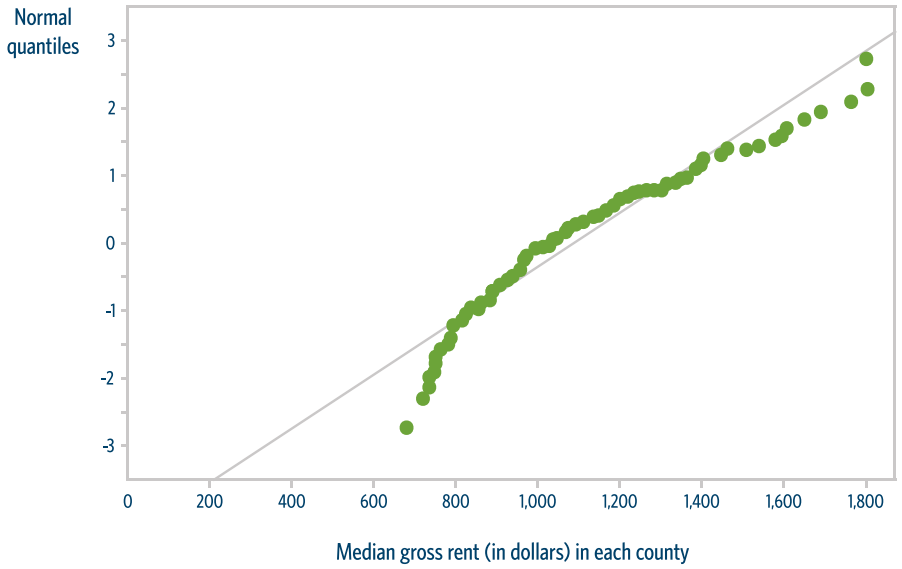
b. Is it approximately symmetrical?

c. Is it approximately bell-shaped?

d. Is it approximately normal?

e. If not normal, is the distribution skewed? If so, in which direction?

4. Examine the normal probability plot below, which shows the median gross household rent in these counties, to answer the questions that follow.



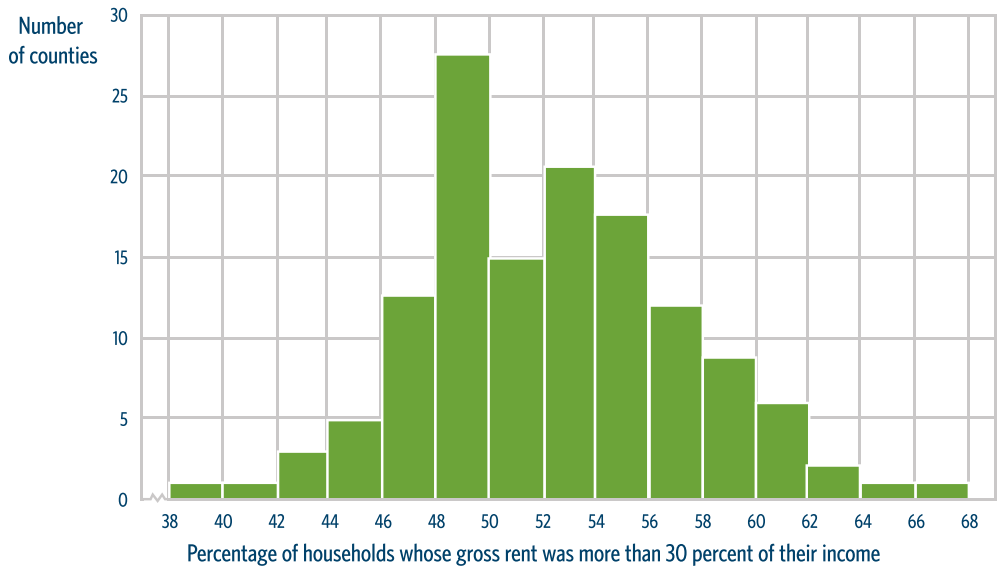
Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this normal probability plot, is the distribution approximately normal? Explain how you know.

b. If not normal, is the distribution skewed? If so, in which direction? Explain how you know.

5. Examine the histogram below, which shows the percentage of people in these counties whose gross rent was more than 30 percent of their income, to answer the questions that follow.



Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this histogram, is the distribution unimodal?

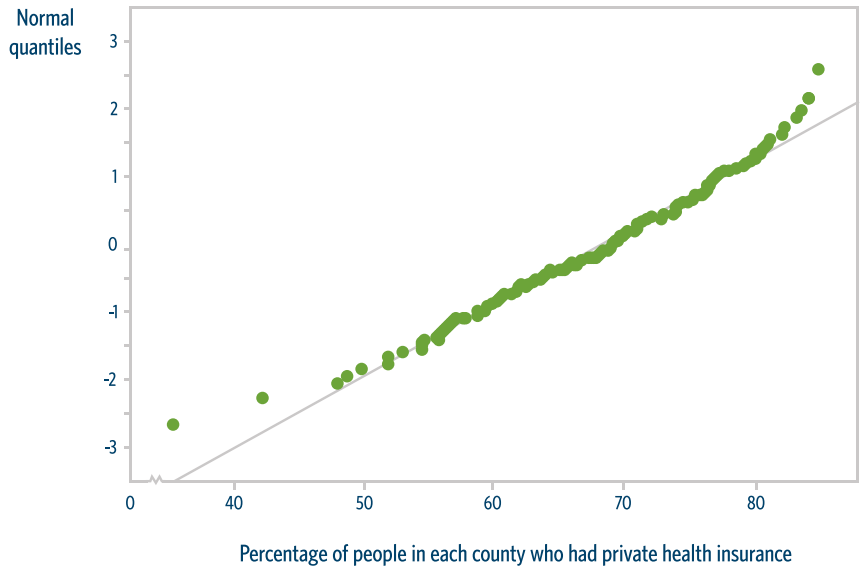
b. Is it approximately symmetrical?

c. Is it approximately bell-shaped?

d. Is it approximately normal?

e. If not normal, is the distribution skewed? If so, in which direction?

6. Examine the normal probability plot below, which shows the percentage of people in these counties who had private health insurance, to answer the questions that follow.



Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this normal probability plot, is the distribution approximately normal? Explain how you know.

b. If not normal, is the distribution skewed? If so, in which direction? Explain how you know.

7. Work with a partner to answer the following questions, using your answers from questions 1–6 and explaining your reasoning.
   a. Was it easier to determine whether a distribution was approximately normal based on a data set's histogram or on its normal probability plot?

   b. Was it easier to determine whether a distribution was skewed based on a data set's histogram or on its normal probability plot?

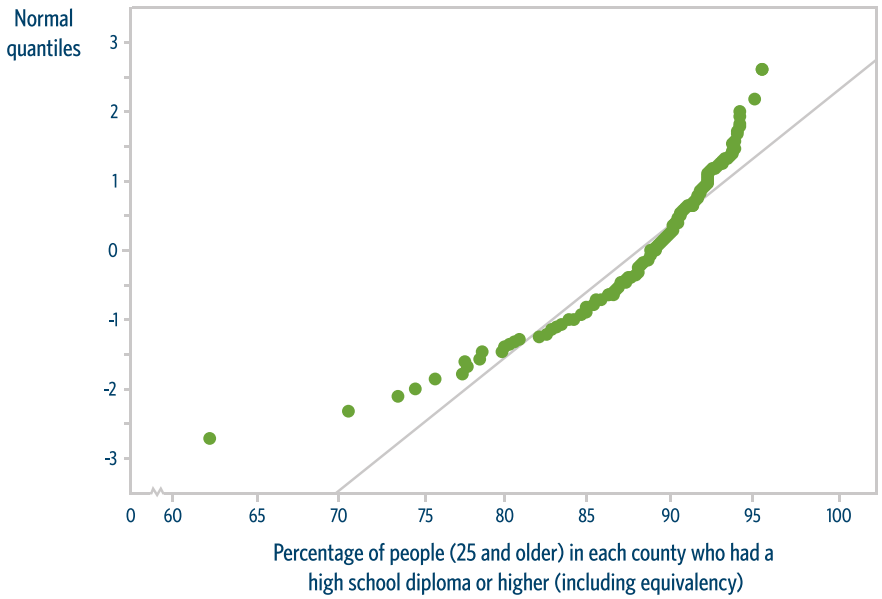
   c. Was it easier to determine the direction of skewness based on a data set's histogram or on its normal probability plot?

   d. Did you and your partner ever make different conclusions about a distribution's shape based on what you saw in the two types of graphs?

Activity Version B

For questions 1–6, you will explore histograms and normal probability plots that use various data from 136 U.S. counties surveyed by the U.S. Census Bureau in 2014.

1. Examine the normal probability plot below, which shows the percentage of people (25 and older) in these counties who had the equivalent of a high school diploma or higher, to answer the questions that follow.



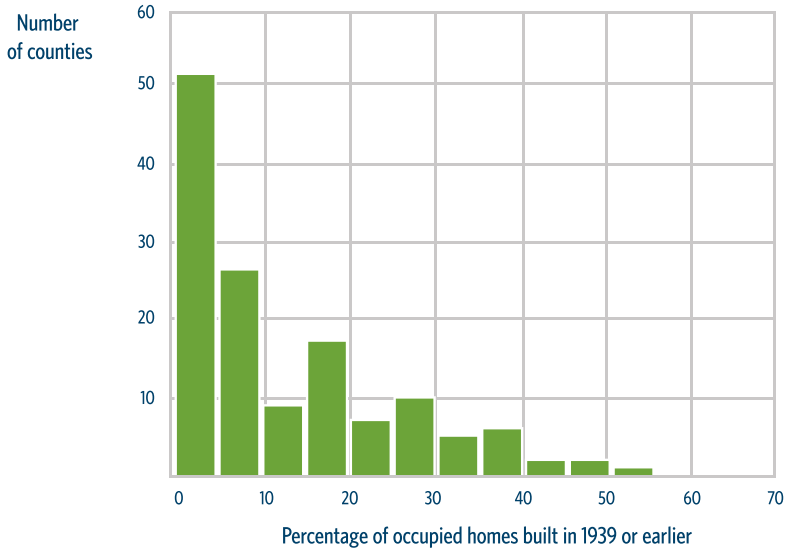
Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this normal probability plot, is the data distribution approximately normal? Explain how you know.

b. If not normal, is the distribution skewed? If so, in which direction? Explain how you know.

2. Examine the histogram below, which shows the percentage of occupied homes built in 1939 or earlier in these counties, to answer the questions that follow.



Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this histogram, is the distribution unimodal?

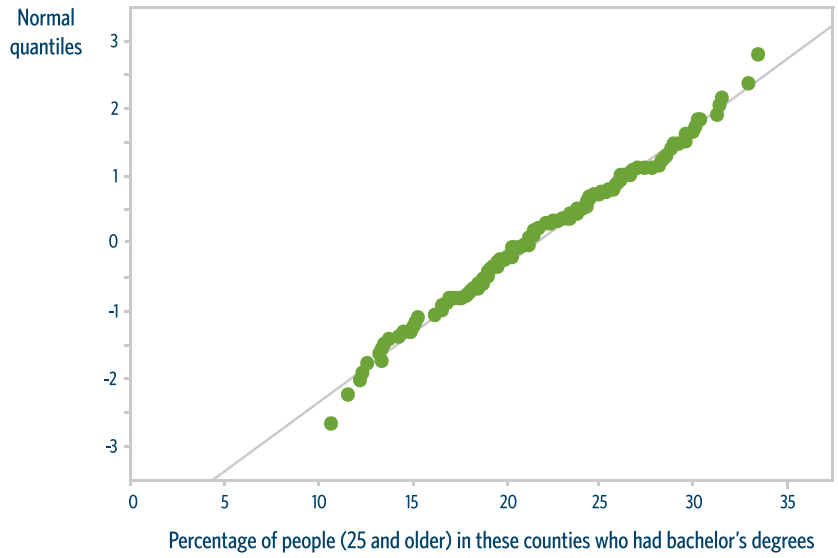
b. Is it approximately symmetrical?

c. Is it approximately bell-shaped?

d. Is it approximately normal?

e. If not normal, is the distribution skewed? If so, in which direction?

3. Examine the normal probability plot below, which shows the percentage of people (25 and older) in each county who had bachelor's degrees, to answer the questions that follow.



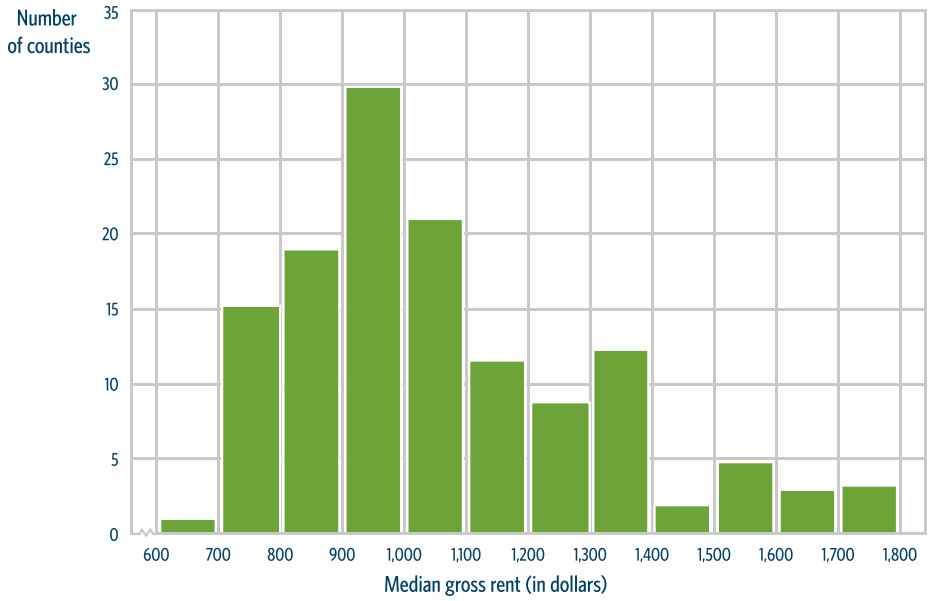
Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this normal probability plot, is the distribution approximately normal? Explain how you know.

b. If not normal, is the distribution skewed? If so, in which direction? Explain how you know.

4. Examine the histogram below, which shows the median gross rent in these counties, to answer the questions that follow.



Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this histogram, is the distribution unimodal?

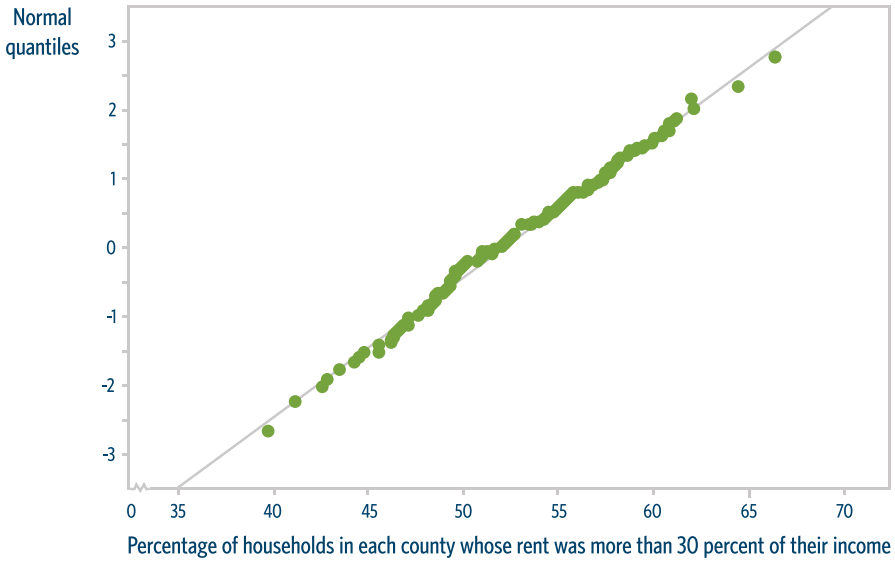
b. Is it approximately symmetrical?

c. Is it approximately bell-shaped?

d. Is it approximately normal?

e. If not normal, is the distribution skewed? If so, in which direction?

5. Examine the normal probability plot below, which shows the percentage of households in these counties whose rent was more than 30 percent of their income, to answer the questions that follow.



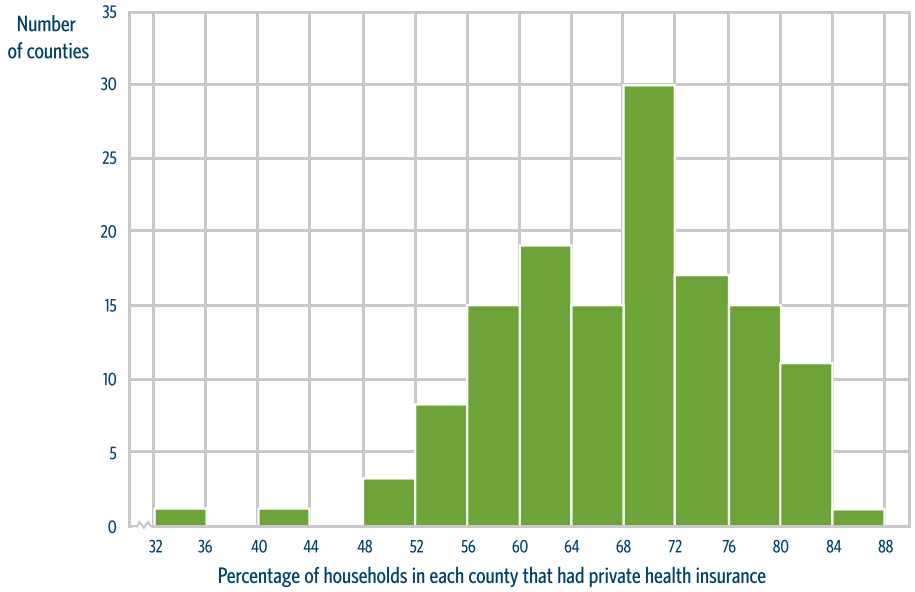
Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this normal probability plot, is the distribution approximately normal? Explain how you know.

b. If not normal, is the distribution skewed? If so, in which direction? Explain how you know.

6. Examine the histogram below, which shows the percentage of households in these counties that had private health insurance, to answer the questions that follow.



Source for data: U.S. Census Bureau, Selected Population Profile in the United States, 2014 American Community Survey 1-Year Estimates.

factfinder.census.gov/bkmk/table/1.0/en/ACS/14_1YR/S0201/0100000US.05000.003

a. Based on what you see in this histogram, is the distribution unimodal?

b. Is it approximately symmetrical?

c. Is it approximately bell-shaped?

d. Is it approximately normal?

e. If not normal, is the distribution skewed? If so, in which direction?

7. Work with a partner to answer the following questions, using your answers from questions 1–6 and explaining your reasoning.
   a. Was it easier to determine whether a distribution was approximately normal based on a data set's histogram or on its normal probability plot?

   b. Was it easier to determine whether a distribution was skewed based on a data set's histogram or on its normal probability plot?

   c. Was it easier to determine the direction of skewness based on a data set's histogram or on its normal probability plot?

   d. Did you and your partner ever make different conclusions about a distribution's shape based on what you saw in the two types of graphs?